

## Alpha<sub>1</sub>-Fetoprotein

ALPHA<sub>1</sub>-FETOPROTEIN (AFP) is a serum protein found in low concentrations in normal adults (<10 nanogram (ng) per ml); concentrations well above this are found in fetal serum and maternal sera (up to 400 ng per ml) and in certain pathological conditions. AFP is synthesized normally by fetal liver, yolk sac and gastrointestinal tract. In adults, serum concentrations above normal may be found associated with tumors arising from or containing elements of these tissues—that is, hepatoma, teratomas (endodermal sinus tumors) and rarely gastrointestinal tumors—as well as with conditions in which liver cell damage or regeneration or both occur (hepatitis, cirrhosis). Determination of the exact serum concentration of AFP during the course of the above diseases may be useful in diagnosis and management.

- *Hepatoma.* In our experience in San Diego, the sera of 22 out of 25 patients with hepatoma had AFP concentrations greater than 350 ng per ml. With growth of a tumor that produces AFP the serum concentration will rise steadily. Following successful surgical removal the serum AFP concentration will fall to normal levels. With recurrence or metastasis, the serum AFP concentration will again rise. Successful chemotherapy may result in a stabilization or decline in sera AFP concentration.

- *Ovarian and testicular tumors.* Teratomas containing endodermal sinus tissue (yolk sac) or fetal liver components will also produce notably elevated serum AFP concentrations (up to 1,000 ng per ml). Therefore, serum AFP can be used for diagnosis and follow-up of these tumors in a way similar to that for hepatomas.

- *Other tumors.* AFP elevations are rarely found with primary gastrointestinal tumors. Elevations above the normal upper limit of 40 ng per ml are found in a small percentage of patients with stomach, pancreas or biliary tract tumors. Elevated AFP is rarely found with other primary tumors, such as lung tumors, and usually only when metastases to the liver have occurred. The AFP concentrations in these circumstances are usually less than 350 ng per ml.

- *Cirrhosis.* Elevations up to 1,000 ng per ml are occasionally found. Serial samples should be obtained since increasing concentrations to above 350 ng per ml suggest development of hepatoma.

- *Viral Hepatitis.* Transient elevations above

350 ng per ml are common. In cases of fulminant hepatitis the serum concentration of AFP may reflect hepatic regeneration. A return to normal is associated with clinical recovery.

- *Pregnancy.* Concentrations up to 400 ng per ml are found in maternal serum during normal pregnancy with the peak levels occurring during the 28th to 36th weeks of pregnancy. Higher concentrations may indicate fetal death, multiple pregnancy or birth defects. Amniotic fluid concentrations of AFP at 15 to 20 weeks gestation range between 15 to 500 ng per ml, but may become notably elevated (>1,000 ng per ml) in association with open neural tube defects and less so with other congenital anomalies which can cause leakage of fetal proteins into amniotic fluid.

AFP determinations may be ordered from: Chemistry Department (c/o Pam McNeil), University Hospital, San Diego, CA 92037.

Samples of at least 1 ml of frozen or azide-preserved serum should be forwarded. Results can be expected within one to two weeks.

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## Current Status of Anaerobic Bacteriology and Anaerobic Infections

SIMPLIFIED PROCEDURES permit all laboratories to do reliable anaerobic bacteriology. Anaerobic jars, including the convenient GasPak®, are effective for clinical work. Conventional or simple tests provide satisfactory identification of five anaerobic groups accounting for 75 percent of infections—*Bacteroides fragilis*, *Bacteroides melanogenicus*, *Fusobacterium nucleatum*, anaerobic cocci and *Clostridium perfringens*. Good guides to susceptibility testing are available.

Clinicians must avoid normal flora in collecting specimens. Transtracheal aspiration permits documentation of pulmonary infection. Specimens must be transported anaerobically.

The incidence of anaerobes in infection is impressive. Ninety percent of brain and lung abscesses contain anaerobes, with no aerobes in two thirds of the cultures. Over 90 percent of cultures

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in aspiration pneumonia yield anaerobes—of which half to two thirds are purely anaerobic. In thoracic empyema (non-postoperative), 75 percent of specimens yield anaerobes—half are the exclusive isolates. Intraabdominal infections contain anaerobes 90 percent of the time, with only 10 percent pure. Anaerobes are found in 70 percent of female genital tract infections, 30 percent in pure culture. Other common anaerobic infections include chronic otitis, mastoiditis and sinusitis; oral and dental infections; bacteremia; liver abscess, and soft tissue infections.

Surgical therapy (drainage, debridement) is essential. Useful antimicrobial drugs include penicillin G or ampicillin (except for *B. fragilis*), carbenicillin, chloramphenicol and clindamycin. Doxycycline and minocycline are less effective and require susceptibility tests. Metronidazole, still experimental, looks promising.

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